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KELLY & POVICH, P.C.
ATTORNEYS AT LAW
1101 30th Street, N.W., Suite 300, Washington, D.C. 20007

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Writer's Direct Dial:
(202) 342-0464

Telephone: (202) 342-0460
Facsimile: (202) 342-0458

May 16, 1995

VIA MESSENGER
Mr. William F. Caton
Acting Secretary
Federal Communications Commission
1919 M Street, N.W., Room 222
Washington, D.C. 20554

Re: Ex Parte Submission, PR Docket 92-235

Dear Mr. Caton:

On behalf of Linear Modulation Technology Limited ("LMT"), this will supplement LMT's April 19, 1995 ex parte submission in the above-referenced docket to provide the enclosed detail regarding current land mobile radio and paging license fees in the United Kingdom. Please note that the U.K. presently affords early users of 5 kHz technology a 50% differential in the license fee. The Telecommunications Bill now under consideration by Parliament, if adopted, will provide the Radiocommunications Agency the authority to implement even greater differentials for the early migration to 5 kHz technology.

Also enclosed is a detailed proposal for implementing license fees in the Private Land Mobile Radio ("PLMR") bands below 512 MHz. There are, of course, many possible combinations of license fees, and the enclosed merely reflects one possible approach. LMT believes that license fees for PLMR systems, such as those described in the attached material, would allocate the true costs of PLMR service and spectrum usage in an economically-efficient manner. LMT, in addition, believes that license fees of the nature described in its proposal would provide a valuable counterpart, supplement or substitute to auctions in order to provide spectrum users the most flexibility in private and commercial system service options while enhancing federal revenue.

LMT understands that adoption of such license fees in these bands may require an extension of the FCC's statutory authority. However, LMT also believes that the time scales over which the refarming decision will be implemented will provide an adequate opportunity for consideration and adoption of such authority. Indeed, LMT believes that the significance of the decisions to be reached in this Docket provide an opportunity for U.S. leadership in the introduction of new, spectrally-efficient technologies.

Should there be any questions concerning the enclosed material, kindly communicate with this office.

Sincerely,

Robert B. Kelly /WAB

Robert B. Kelly

cc: Robert H. McNamara
Wireless Telecommuications Bureau
Gregory L. Rosston
Office of Plans and Policy
Jackie Chorney
Wireless Telecommunications Bureau
Jay Markley
Wireless Telecommunications Bureau

Spectrum Pricing -

an effective solution

to

Spectrum Management

Securicor Linear Modulation Technology Ltd.

Initial Assumptions:

Spectrum efficiency is characterized by three dimensions:

Bandwidth
Signal strength
Time / Exclusivity

Licensing has typically treated only one of these dimensions, signal strength, as a variable.

A license is a basic building block / unit of measure.
Multiple licenses could be awarded to any licensee.
Licenses have value.
Licenses for exclusive operation have higher value than licenses for shared operation.
Licenses for higher grades of service within the authorized service area have higher value.
To provide more up-to-date inputs to the FCC database
To provide a method of rapid adjustment of the fees structure in the light of demand / experience.
Fees should be priced and collected annually.

We are not proposing major changes in the characterization of the license. Rather, we propose to maintain bandwidth as a constant but at the smallest value.

Bandwidth:

We propose 2.5 kHz as the basic unit of bandwidth, effective with the implementation date of spectrum refarming. The Commission may choose to treat applicants for urban stations differently from applicants for rural stations to encourage early transition in the most congested areas.

Both new applicants and renewing licensees who require more than 2.5 kHz bandwidth to accomplish their communications requirements would be granted multiple licenses for units of adjoining spectrum. Thus, applicants requesting 25 kHz of bandwidth for current analog FM technology would receive a license for a 10 channel block and would pay 10 times the fee. Applicants requesting 12.5 kHz of contiguous bandwidth would receive 5 licenses and would pay 5 times the base rate. Applicants requesting 5 kHz would receive 2 licenses and would pay 2 times the base rate. Those requiring only 2.5 kHz or less would receive one license and pay only the base rate.

Exclusivity:

The Commission's current proposal would permit licensees to achieve exclusivity within their service area if they secure the agreement of the other licensees within a radius of 50 miles. We believe the importance of exclusivity on future licensees is overlooked by this proposal. In essence, the public's share of future benefit is

exchanged for the application fee. This is an appropriate transaction only if the applicant wanting exclusive use adequately compensates the public. [An analogy is a private exclusive lease of public property.] The base rate would remain for shared use, because no one would be denied access to the resource.

We propose two classes of license, one for exclusive use and one for shared use, with proportionately different fee structures.

We suggest that requests for exclusive operation be assessed at least 10 or more times the basic license fee. Again, the Commission may wish to treat the largest conurbations differently from the remainder of the country, due to the forbearance of larger numbers of future licensees from the exclusively awarded resource. Many combinations are possible.

Signal Strength:

To encourage the maximization of communications capacity, we propose a fee structure for signal strength that accommodates the requested service area of the median private licensee for each frequency band within the basic rate, and increases fees proportionately for users needing an increased grade of service or a larger service area.

The reuse of spectrum is determined in large part by the radiated power and antenna height of the transmitter. The useable service area is also determined by these parameters as well as the desired signal reliability and, for two way communications, the reciprocity between the received signal strength of the station at one location and that of the responding station.

We use signal strength in a generic sense rather than a specific one. We suggest the FCC use 37 dB above 1 microvolt per meter for the l30-50 MHz, 72-76 MHz and 150-174 MHz bands and 39 dB above 1 microvolt per meter for the 450-470 MHz and 470-512 MHz bands.These signal leels provide median time variability and 90 % location variability. The MSAM model of the National Telecommunications and Information Administration is the preferred spectrum analysis model.

Also, the MSAM model should be used to evaluate the median and mean antenna height and power values of the database for each of the frequency bands. These values can then be used as the baseline.

Some guesswork is required to determine the appropriate effective radiated power for the VHF and UHF 450-470 MHz bands. The FCC has not collected data about the effective radiated power in these bands. However, systems design experience suggests a 0 dB antenna gain and 2 dB line loss or 2/3 the transmitter output power for the 30- 50 MHz band, a 3 dB gain antenna and a transmission line loss of 2 dB for a

typical system for a net 1 dB gain, equating the radiated power with 1.26 times the transmitter output power for the 150 MHz band. For 450 MHz systems, the typical antenna gain is about 6 dB with a 3 dB line and filter loss for a net gain of about 3 dB, or 2 times the transmitter output power. Because of the vast acceptance of the movement towards portable communications where low powers are normal, an alternative is to allow only 25 Watts effective radiated power unless a licensee has an exclusive channel.

The effects of transmitter antenna height and power are logarithmic functions. Doubling the antenna height or quadrupling the radiated power will increase signal strength by 6 dB, resulting in significantly more interference to co-channel and adjacent channel users.

We suggest an additional license fee be required for every 6 dB of increased signal strength beyond the values determined by application of the MSAM model. This additional license and its attendant fee will provide a strong incentive to conserve the use of the resource unless there is economic justification.

Eligibility:

As a general aspiration no organization should be exempt from license fees. The Federal government incurs a cost to administer the frequency spectrum and it may be the time when neither state nor local governments should be considered exempt from the economic reality of spectrum management. However this may be a longer term policy objective after full debate of the issues. State and local governmental entities currently pay the Association of Public-Safety Communications Officials, International, Inc., APCO, a fee to coordinate frequencies for their use. Frequency coordination is a revenue generator for the coordinators. If this minor part of the spectrum management process is seen as a good value, surely the license itself has a greater value.

Finally, under today's rules, no good way exists to determine spectrum usage and access time without extensive measurements taken nationally, a very expensive proposition. Traditionally, the number of mobiles per frequency has been used as an indicator of spectrum use, but the number of licensed mobiles is thought to be wildly inaccurate. However, if the applicants have both an economic incentive and a regulatory obligation to provide accurate information, either in the original license application or on its annual renewal, the accuracy of the number of units in service will improve, and mobile and portable units can be more closely correlated with spectrum use.

We recommend that each mobile and portable be assessed a spectrum access fee. This can be accommodated by a multiplier assessed against the basic rate or by a separate license for each mobile or portable or group subscriber equipment in, say, blocks of 10 units.

Examples:

Following are algorithms that might be applied according to this paper with sample calculations.

NL = (NC)(B + E + S(n/360))

where

NL = number of licenses

NC = number of channels / repeaters / fixed transmitters

B = **Bandwidth** factor in 2.5 kHz blocks (i.e. for 2.5 kHz, 2.5 / 2.5 kHz = 1; for 5 kHz, 5 / 2.5 kHz = 2 ; for 12.5 kHz, 12.5 / 2.5 = 5, etc.)

E = **Exclusivity** factor: 0 if shared; 5 (rural area), 10 (urban area), (or any other factor) if exclusive within the median service area for the frequency band.

S = **Signal Strength** factor: 0 if at or below the MSAM value, 1 for signal strengths between the MSAM value and MSAM + 6 dB, 2 for signal strengths 12 dB above the MSAM value, etc. For offset antenna patterns, a reduction factor of n / 360, (where n= angle of radiation and 360 = the number of degrees in a circle) is suggested to encourage the tailoring of coverage patterns to the desired service area.

Total Fees = [(RB) (NL) + (RM) (number of units)]

where

RB = Annual basic rate (the first annual multiplier factor applied to all licenses)

RM = Rate per subscriber unit (the second annual multiplier factor applied to all licenses)

NL= Number of licenses

Example 1:

The application requests a renewal of a license for a 25 kHz 150 MHz non-commercial station operating on one channel. The station parameters are 90 watts effective radiated power at 100 feet above average terrain and an omnidirectional service radius of 20 miles. The applicant lists 10 mobiles to be used with the station.

The station parameters are assumed to fall within the MSAM values. Calculation of the fee is as follows, assuming the annual basic rate is $125.00 and the annual subscriber unit rate is $15.00:

NL = 1[(25 kHz / 2.5 kHz) + 0 + 0] = 10

Total Cost = [($125.00)(10) + ($15.00)(10) = $1,400.00

Example 2:

The application is for a 1 channel 150 MHz 5 kHz shared assignment with 10 subscriber units. All other parameters are as in Example 1.

NL = 1[(5 / 2.5) + 0 + 0] = 2

Total Cost = [($125)(2) + ($15.00)(10)] = $ 400.00

Example 3:

The application is for a 5 channel 800 MHz 25 kHz exclusive assignment with a signal strength 12dB above the MSAM level, with 70 subscriber units in an urban area. Rates are the same as in the previous examples. E, the exclusivity factor, is set at 10. S, the signal strength factor, is set at 2.

NL = 5[(25/2.5) + 10 + 2] = 22

Total Cost = [($125.00)(22) + ($15.00)(70) = $3,800.00

We believe these examples are sufficient to demonstrate application of the principles of cost benefit analyses to spectrum efficiency. It would be easy to construct a model showing the annual Federal income and the variations due to the multiplier factors.

LAND MOBILE RADIO AND PAGING LICENCE FEES

NOTIFICATION OF CHANGES TO LICENCE FEES FROM 1 APRIL 1994

Private Mobile Radio (standard)
£6,000 for each national channel

£ 120 for up to 10 mobile stations
£ 250 for 11-25 mobile stations
£ 500 for 26-60 mobile stations
£1,000 for 61-100 mobile stations
£1,750 for 101-200 mobile stations
£3,500 for 201-500 mobiles stations
£7,000 for 501-1,000 mobile stations

For more than 1,000 mobile stations
£7,000 for the first 1,000 plus
£5,000 for each successive group of 500 and
£5,000 for any final group of less than 500

For 5KHz channels the fee is 50 per cent of that given above

Private Mobile Radio Short Term Hire
As for PMR (Standard)

National Wide Area Paging
£6,000 for each national channel

Local Wide Area Paging
£250 for each base station subject to a maximum of £6,000

There will be no change in fees for the following licence types:

Common Base Station Operator - For each base station - £750 for each channel designated for use by that base station

PMR Parking And Demonstration - £150

PMR Road Construction - £750

Radiating Cable - £50 for each base station

Radiocommunications Agency
April 1994